



# Pump Up your Knowledge:

## Best Practices for the Management of Automated Insulin Delivery (AID) Systems

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# Disclosures

The planner(s) and speaker(s) have indicated that there are no relevant financial relationships with any ineligible companies to disclose.

# Learning Objectives

At the end of this session, learners should be able to:

1. Identify the key components of automated insulin delivery (AID) systems, including insulin pumps, continuous glucose monitors (CGMs) and algorithm functions
2. Compare and contrast commonly used AID systems
3. Interpret CGM and pump report data to adjust pump settings
4. Utilize patient counseling to promote safe and effective use of AID systems

# Outline

Background/insulin pump overview

Introduction to AID systems

- Device specifics
- CGM compatibility
- Differences between AID algorithms

Reviewing and interpreting CGM/pump reports

- Reading reports & making adjustments

Patient considerations

- Approvals
- Characteristics of good pump candidates
- Access and affordability

Safety considerations

- Pump related issues
- Back up plans & programmed settings
- Hypoglycemia & hyperglycemia

Patient counseling

- Temporary targets
- Pump counseling

Summary/conclusion

# Abbreviation Key

- ADA = American Diabetes Association
- AID = automated insulin delivery system
- BG = blood glucose
- CGM = continuous glucose monitor
- ICR = insulin to carbohydrate ratio
- ISF = insulin sensitivity factor
- IOB = insulin on board
- T1DM = type 1 diabetes mellitus
- T2DM = type 2 diabetes mellitus
- MDI = multiple daily injections
- CSII = continuous subcutaneous insulin infusion

# Background

# Background

- Insulin pumps = small, wearable devices that deliver insulin continuously, in order to control glucose levels
- Approved to use with U100 rapid acting insulin
- Basal coverage is provided via small, continuous doses of insulin to provide background blood glucose control
- Bolus doses are taken at meal times or for elevated blood sugar readings to manage rise in blood glucose

# Background

- Require filling of reservoir/cartridge with insulin
  - Changed every 2-3 days
- Pump delivers insulin to a cannula under the skin
  - Small, flexible tube in subcutaneous layer
- Require initial programming
  - Varies by pump: typically includes initial basal rate, insulin to carb ratio, sensitivity factor, etc.



# Background

Insulin to  
carbohydrate  
ratio (ICR)

Sensitivity  
factor (ISF)

Glucose target

Active insulin  
time

Max bolus

Extended  
bolus

Temporary  
basal

Insulin on  
board (IOB)

# Background

**Insulin to carbohydrate ratio:** amount of carbohydrates (in grams) covered by one unit of insulin

**Insulin sensitivity factor/correction factor:** how much one unit of insulin will lower blood sugar

**Glucose target:** glucose goal used to calculate correction bolus and/or guide insulin delivery

**Active insulin time:** amount of time that insulin is considered to be effective at lowering glucose (*helps to prevent insulin stacking*)

**Max bolus:** maximum amount of bolus insulin allowed by pump to be delivered in one dose

**Extended bolus:** allows for delivery of a bolus over a period of time (option for some insulin pumps)

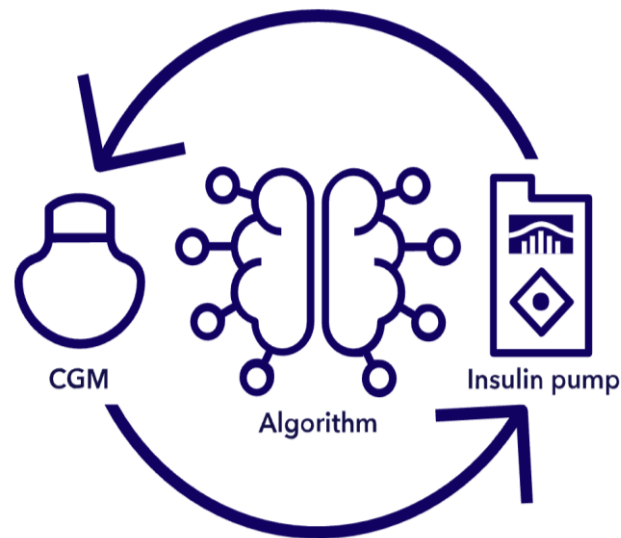
**Temporary basal:** adjusted basal insulin rate for a set time (*exercise, sleep, etc.*)

**Insulin on board (IOB):** how much active insulin remains in body from previous doses

# Background

**Automated insulin delivery (AID)** = system comprised of insulin pump, CGM and algorithm to adjust insulin delivery in real time

- Does require input from wearer
- Some AID systems may provide automatic correction doses



Medtronic Diabetes (n.d.)

# Background

## 2026 ADA Recommendations for AIDs

7.8 7.8a	<p><b>Consider early initiation</b>, including at diagnosis, of CGM, CSII, and AID depending on a person's or caregiver's needs and preferences (C)</p> <p><i>There should be no requirement of C-peptide level (B), the presence of islet autoantibodies (B), or duration of insulin treatment (C), before initiation of CSII or AID</i></p>
7.25a 7.25b	<p><b>AID systems are the preferred insulin delivery method</b> over MDI, CSII, and sensor-augmented pumps in people with type 1 diabetes (A), adults with type 2 diabetes (A), children and adolescents with type 2 diabetes (E), and those with other forms of insulin-deficient diabetes (B-E). <u>Choice of an AID system should be made based on the individual's circumstances, preferences, and needs.</u></p> <p><i>Consider AID systems for select people with type 2 diabetes treated with basal insulin not achieving individualized glycemic goals (B).</i></p>

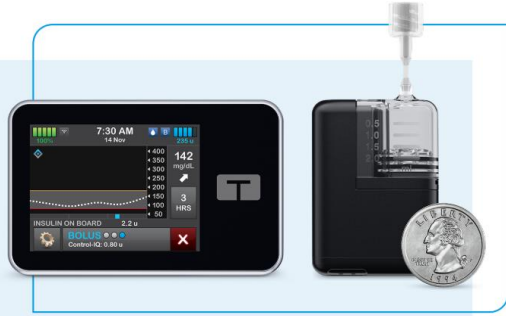
# Automated Insulin Delivery Systems

# Automated Insulin Delivery Systems

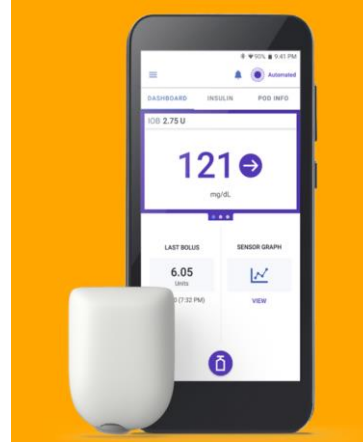
Currently available: 6 devices across 5 algorithms

Manufacturer	Tandem™	Medtronic™	Insulet™	Beta Bionics™	Sequel™
Algorithm	Control IQ+™	SmartGuard™	SmartAdjust™	ILet Dosing Decision™	Tidepool Loop™
Current devices	Tslim X2™, Mobi™	Minimed™ 780G	Omnipod™ 5	ILet Bionic Pancreas™	Twiiist™

# Automated Insulin Delivery Systems



Tandem Diabetes Care, Inc. (n.d.)



Insulet Corporation (n.d.)



Medtronic (n.d.)



Sequel Med Tech, LLC (2025)

Association of Diabetes Care & Education Specialists (2025)

# Tandem™ (Control IQ+™)

## Tandem Tslim X2™

- Tubed pump, infusion sets replaced and rotated every 2-3 days
  - Does have option for extended infusion set (7 days)
- Controlled via on-pump screen or mobile app
- Insulin capacity: 300 units (minimum 120 units)
- CGM compatibility: Dexcom® G6/G7, Libre® 2+/3+
  - Starting July 2026, will no longer be compatible with Libre® 2+
- Software updates pushed to device



Tandem Diabetes Care, Inc. (n.d.)



# Tandem™ (Control IQ+™)

## Tandem Mobi™

- Tubed pump with option for on-body wear
  - Using adhesive sleeve
- No screen, does have quick bolus option on pump
  - Quick bolus set up on app, can be input as grams or units
- Controlled via smartphone app – **iPhone only**
  - Android version of app cleared by FDA November 2025
- Insulin capacity: 200 units (minimum 30 units)
- CGM compatibility: Dexcom® G6/G7



Tandem Diabetes Care, Inc. (n.d.)

# Tandem™ (Control IQ+™)

## Control IQ+™

- **Target glucose:** 112.5-160 mg/dL
- **Auto basal rates:** adjusts programmed basal rates every 5 minutes based on 30 minute prediction of CGM glucose
- **Auto boluses:** if glucose is predicted to be >180 mg/dL in next 30 mins, automatic correction dose is delivered
  - Max of one per hour
- **Activity features:**
  - Exercise activity: changes target range to 140-160 mg/dL
  - Sleep activity: narrows target range to 112.5-120 mg/dL, disables auto boluses
- **Revert to manual mode:** if no CGM data ≥20 minutes, will revert to programmed basal settings
- **Other features:** extended bolus feature

# Tandem™ (Control IQ+™)

## Control IQ+™

- Pump settings that impact **automated** basal insulin delivery:

Basal rates

Insulin sensitivity/correction factor

- Adjustments impacting boluses:
  - ICR, ISF
- **Cannot** adjust in automated mode:
  - Active insulin time – set at 5 hours
  - Correction bolus target – fixed at 110 mg/dL

# Medtronic™ (SmartGuard™)

## Minimed™ 780G:

- Tubed pump
  - Option of 7-day infusion set
- Insulin capacity: 300 units
- CGM compatibility: Guardian™ 4, Simplerla Sync™
  - New: Libre® Instinct
- Must start in manual mode for 48 hours before switching to automated mode (initial activation)
  - 5 hour warm up period for sensor changes or software update



Medtronic (n.d.)

# Medtronic™ (SmartGuard™)

## SmartGuard™

- **Algorithm target:** can be set at 100 mg/dL, 110 mg/dL, or 120 mg/dL
- **Auto basal rates:** calculated from total daily insulin, adjusted every 5 minutes based on CGM glucose trends
- **Auto boluses:** delivered if glucose is >120 mg/dL and already delivering maximum auto basal
  - Max of 1 auto bolus every 5 minutes, up to 12 boluses/hr
- **Activity feature:** can be set to 150 mg/dL to reduce auto basal delivery and disable auto correction boluses for up to 24 hours
- **Revert to manual mode:** if loss of CGM connection, kicks into Safe Basal
  - Safe Basal delivers algorithm basal rate, but no auto correction boluses. If no action taken in 4 hours, will revert to programmed settings
- **Other features:** meal detection technology

# Medtronic™ (SmartGuard™)

## SmartGuard™

- Pump settings that impact **automated** basal insulin delivery:

Auto basal target

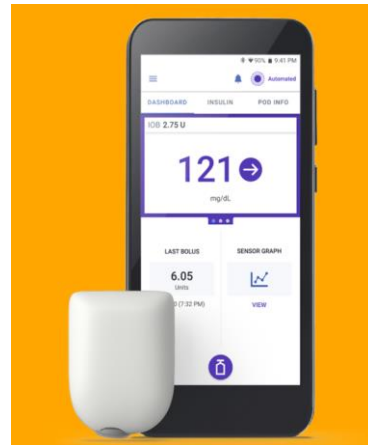
Active insulin time

- Adjustments impacting boluses:
  - ICR, active insulin time
- **Cannot** adjust in automated mode:
  - Basal rate
  - Correction/sensitivity factor
  - Correction bolus target – set at 120 mg/dL

# Omnipod™ (SmartAdjust™)

## Omnipod 5™

- Tubeless pump; disposable
- Pod changed every 3 days (max)
  - Pods physically stop working
- Operated via smartphone app or controller device
- Insulin capacity: 200 units (minimum 85 units)
- CGM compatibility: Libre® 2+, Dexcom® G6 and G7 (including G7 15 day)
- Must have phone/controller for entering bolus
  - No quick bolus on pod



Insulet Corporation (n.d.)

# Omnipod™ (SmartAdjust™)

## SmartAdjust™

- **Algorithm target:** can be set at 110, 120, 130, 140, or 150mg/dL
- **Auto basal:** adaptive basal feature updates basal with each pod change and adjusts rate every 5 minutes based on CGM 60-minute prediction
- **Automated bolus: none**
- **Activity features:**
  - Activity feature: changes target to 150 mg/dL and decreases doses by ~50% adaptive basal for selected duration
- **Revert to manual mode:** if loss of CGM connection  $\geq 20$  minutes or automated delivery restriction alarm
  - Delivers programmed basal rate, no auto basal adjustments
    - Pod will not return to automated mode on own
- **Other features:** custom foods feature



# Omnipod™ (SmartAdjust™)

## SmartAdjust™

- Pump settings that impact automated basal insulin delivery:

Target glucose

Total daily insulin

- Adjustments impacting boluses:
  - ICR, ISF, insulin active time, reverse correction, glucose target
- Cannot adjust in automated mode:
  - Basal rates

# Bionic Pancreas™ (iLet Dosing Decision™)

## Bionic Pancreas™

- Tubed pump
- Controlled via on-pump screen or mobile app
- Insulin capacity: 180 units (minimum 120 units)
- CGM compatibility: Dexcom® G6/G7 (including G7 15 day) and Libre® 3+
- Set up only requires that weight be input into device – no manual set up of ICR, ISF, basal rates, etc.



Association of Diabetes Care & Education Specialists (2025)

# Bionic Pancreas™ (iLet Dosing Decision™)

## iLet Dosing Decisions™

- **Algorithm target:** "usual" (120mg/dL), "lower" (110mg/dL), "higher" (130 mg/dL)
  - No programmed pump settings
- **Auto basal:** adjusts every 5 minutes based on CGM glucose trends and previous doses
- **Auto bolus:** determined every 5 minutes based on current glucose level & trend, insulin on board, and adapted aggressiveness
- **Activity features:** users can pause insulin delivery for a specified time
- **Revert to manual mode:** if no CGM connection, can operate in BG-run mode for 72 hours
  - Prompts user to manually enter blood glucose values periodically, continues automation
  - **After 72 hours, will no longer deliver insulin** (no true "manual mode")
- **Other features: Meal announcements - no formal carb counting or ICR**
  - Options: Breakfast/lunch/dinner and usual/more/less

# Twist™ (Tidepool™)

## Twist™

- Tubed pump
  - Flexible wear options
- Controlled by app – **iPhone only**
  - On pump quick bolus option
- Insulin capacity: 300 units
- CGM compatibility: Libre® 3+, Eversense® 365
- Uses iiSure technology to detect insulin delivery blockages



Sequel Med Tech, LLC (2025)

# Twist™ (Tidepool™)

## Tidepool™

- **Algorithm target:** can be set as any range between 87-180 mg/dL (targets middle of range)
- **Auto basal:** adjusts programmed basal rates every 5 minutes based on a 6 hour predicted CGM glucose
- **Auto bolus: None**
- **Activity features:**
  - Workout preset range (can be set from 87-250 mg/dL)
- **Revert to manual mode:** if no CGM data >15 minutes
- **Other features:**
  - Can adjust carb entries proactively (up to 1 hour before) or retroactively by entering time of meal in bolus menu
  - Able to distinguish between type of carbs for bolus dosing using selected emojis
    - 🌈 = rapid acting carbs, 🥗 = moderate carb/fat/protein foods, 🍗 = higher fat/protein carbs

# Twist™ (Tidepool™)

## Tidepool™

- Pump settings that impact automated basal insulin delivery

Basal rates

Max basal rates

Correction range

Glucose safety limit

- Adjustments impacting boluses:
  - ICR, ISF, correction range, carbohydrate type
- Cannot adjust in automated mode:
  - Active insulin time – set at 6 hours

	<b>CONTROL-IQ+™</b>	<b>SMARTGUARD™</b>	<b>SMARTADJUST™</b>	<b>ILET™</b>	<b>TIDEPOOL™</b>
<b>Basal adjustments</b>	Adjusts programmed basal every 5 minutes based on 30 minute CGM prediction	Calculated from total daily insulin, adjusted every 5 minutes based on CGM glucose trends	Adjusts basal every 5 minutes based on 60 minute prediction of glucose from CGM	Adjusts every 5 minutes based on CGM trends and previous doses	Adjusts every 5 minutes based on 6 hour predicted glucose
<b>Automatic boluses</b>	Delivered if glucose predicted to be >180 in next 30 minutes; max 1 per hour	Delivered if glucose predicted to be >120 and already delivering max basal; max 1 every 5 mins	None, increase basal instead	Automatic correction boluses every 5 minutes if CGM above target setting	None, increase basal instead
<b>Target glucose (mg/dL)</b>	112.5-160	Set at 100, 110, or 120	110, 120, 130, 140, 150	110, 120, 130	Can be set anywhere 87-180
<b>Insulin capacity</b>	300 units (tslim) 200 units (mobi)	300 units	200 units	180 units	300 units
<b>CGM compatibility</b>	Dexcom® G6/G7 (both), Libre® 3+ (tslim)	Medtronic Guardian 4, Simplera sync	Dexcom® G6/G7, Libre® 2+/3+	Dexcom® G6/G7, Libre® 3+	Libre® 3+, Eversense 365

# Assessment Question #1

Which of the following pumps has the lowest programmable glucose target?

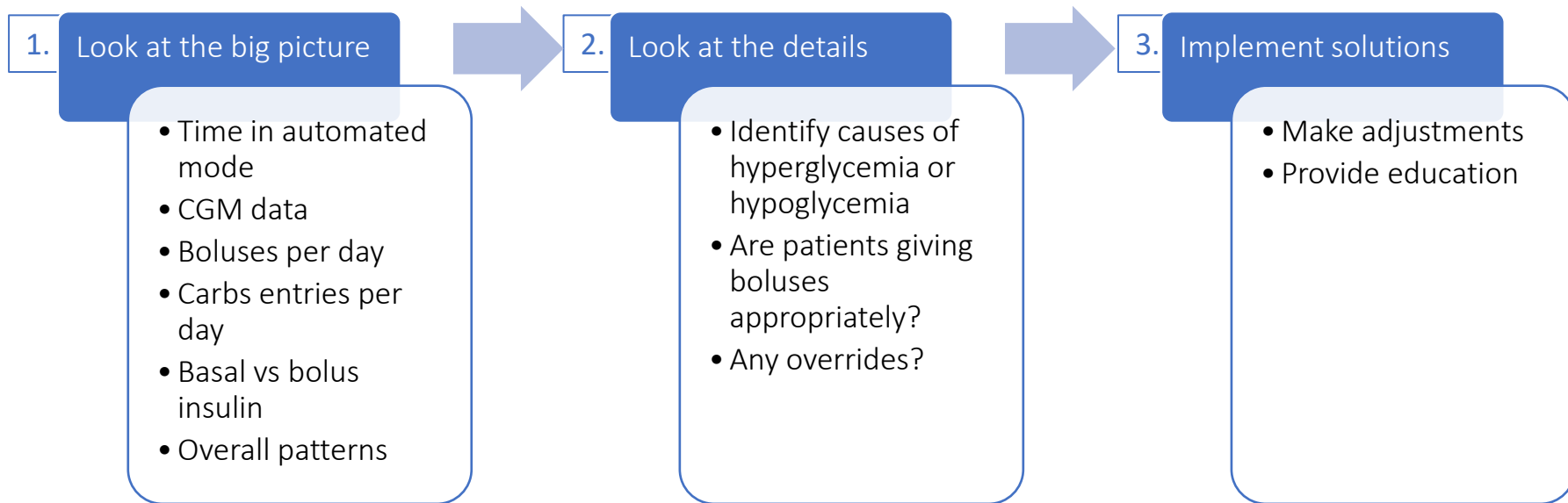
- A. Insulet Omnipod 5™
- B. Medtronic™ Minimed 780G
- C. Tandem Mobi™
- D. Sequel Twiist™



# Interpreting Reports

# Pump Reports

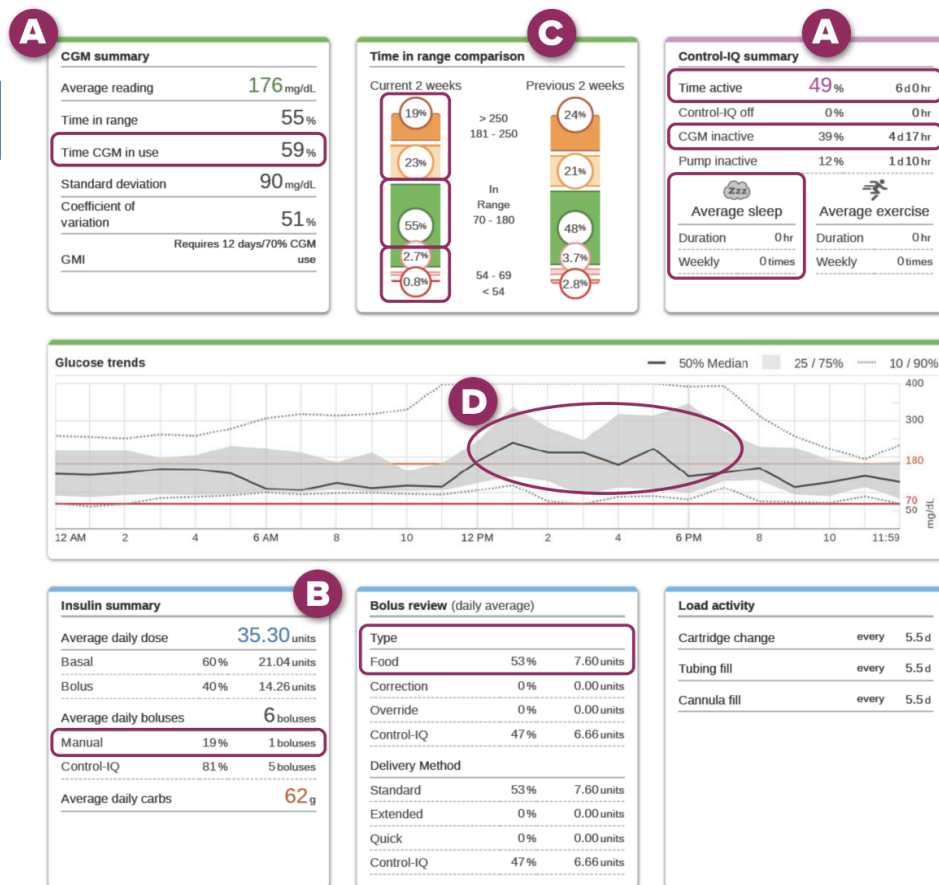
How to assess pump reports:



# Pump Reports

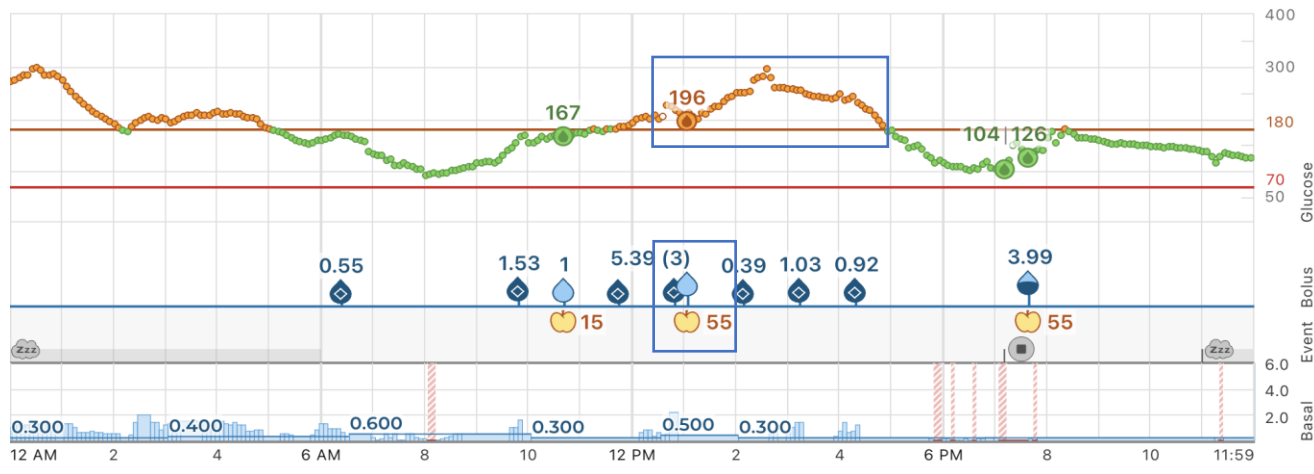
## 1. Look at the big picture

- A. Using CGM and Control-IQ+™?
  - Aim for >90% CGM time in use and >90% Control-IQ+ active
- B. Giving boluses?
- C. Meeting glycemic targets?
  - Goal time in range >70%
  - Goal time below range <4%
  - Goal time above range <25%
- D. Patterns of hyperglycemia and/or hypoglycemia



# Pump Reports

## Tandem Control-IQ+™ Report



2. Look at the details

3. Solutions

Glucose (mg/dL)

- BG High
- CGM High
- BG In Range
- CGM In Range
- BG Low
- CGM Low
- Auto Populated BG
- CGM Backfill

Bolus (units)

- Food
- Correction
- Food + Correction
- Quick
- Auto
- Override Increase
- Override Decrease

Basal (units/hr)

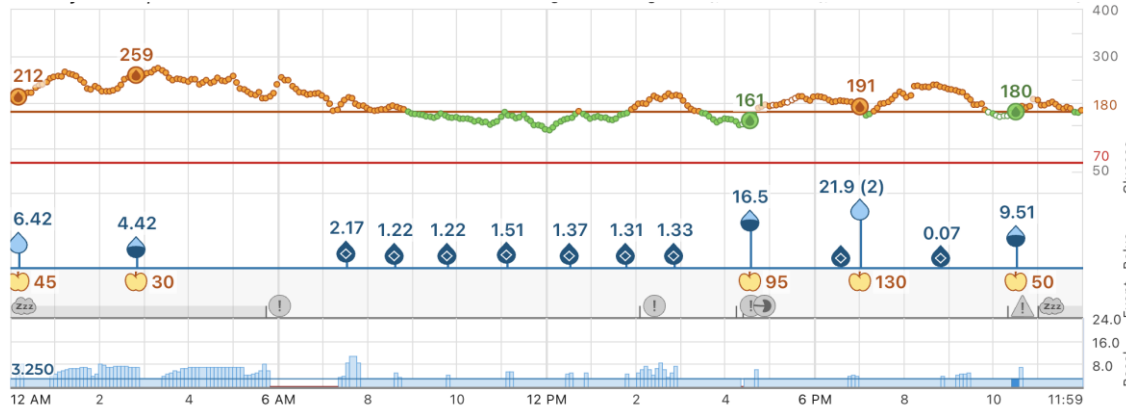
- Profile Delivered
- Profile Setting
- Temporary
- Control-IQ
- 0 units/hr
- - 0 units/hr Temp.
- Auto Suspend

Event

- Carbs (g)
- Sleep
- Exercise
- Cartridge/Site Change
- Event Duration
- Lost CGM Connection
- CGM Alert
- Pump Alarm
- Manual Stop
- Shutdown

# Assessment Question #2

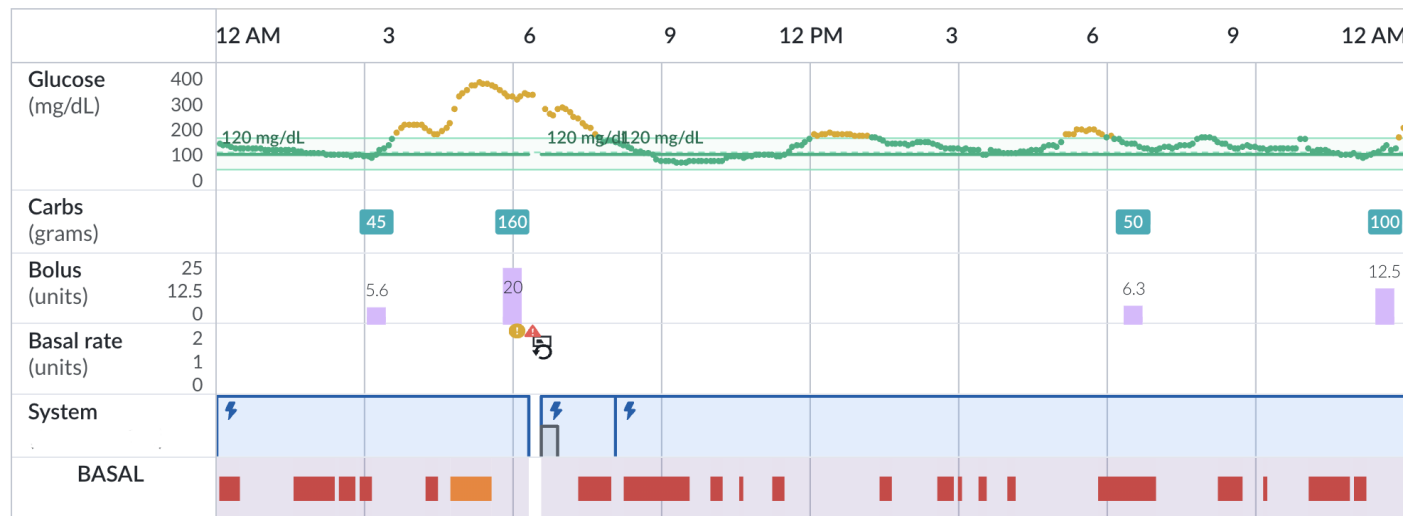
Consider the following pump report. Patient is a 47-year-old male with type 2 diabetes. He reports confidence with carb counting and changes infusion site every 3 days. He is an avid sports fan and has been staying up later to watch games. Which of the following adjustments can be made to improve hyperglycemia?



- A. Adjust target glucose during overnight hours
- B. Increase insulin sensitivity factor
- C. Adjust sleep activity schedule
- D. Decrease active insulin time to 3 hours

# Pump Reports

## SmartAdjust™ Report



- System
- Automated Mode
  - Automated: Limited
  - Manual

- Glucose
- Before Meal Target Range (70 - 130 mg/dL)
  - After Meal Target Range (70 - 180 mg/dL)
  - Above Range
  - In Target Range

- Types of Readings
- Pump BG
  - CGM Readings
  - Carbs

- Insulin Dose
- Bolus (Delivered)

- Basal
- Set/Site Change
  - Reservoir Change
  - Pump Alarm
  - Advisory Alert

- Basal Delivery -
- Automated Delivery
  - Automated Max Delivery
  - Automated Pause

# Patient Considerations

# Approvals

	Control-IQ+™	SmartGuard™	SmartAdjust™	iLet™	Tidepool™
Approval	T1DM & T2DM	T1DM & T2DM	T1DM & T2DM	T1DM	T1DM
Age requirement	2 years+ (T1DM), 18 years+ (T2DM)	7 years+ (T1DM), 18 years+ (T2DM)	2 years+ (T1DM), 18 years+ (T2DM)	6 years+	6 years+



# Who is a good pump candidate?

T1DM or T2DM  
requiring insulin

Carb awareness

Struggles with  
compliance to MDI due  
to injection burden

Will interact with pump  
(meal entries, etc.) or  
has a caregiver able to  
manage

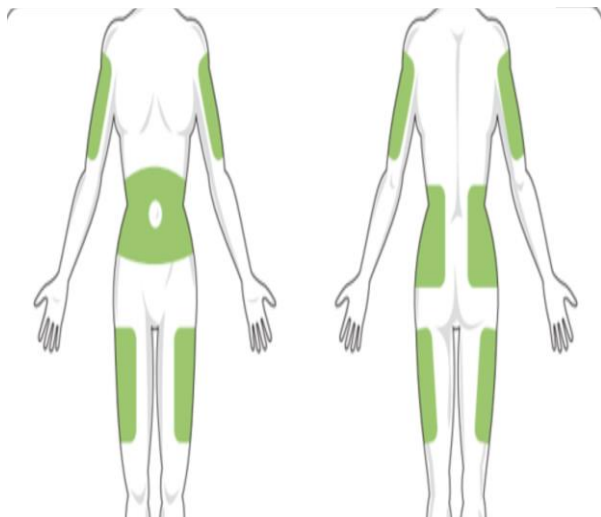
Willing to wear a CGM  
(or frequently check  
blood sugar)

Willingness to follow up  
regularly for initial set up

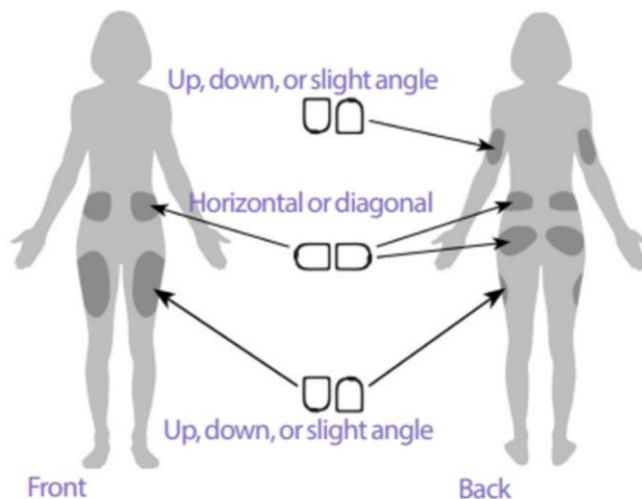
Understands difference  
between insulin  
delivery methods and  
safety risks if off pump

# Pump placement

## Sites for infusion set



## Omnipod™



Reminder: Omnipod™  
and Tandem Mobi™  
can be worn on body

# Access/affordability

ADA Standards of Care 2026:

*"Adoption of AID and pump therapy in the U.S. shows geographical variations, which may be related to health care professional preference or center characteristics and socioeconomic status, as pump therapy is more common in individuals of higher socioeconomic status...  
**addressing the differences in access to insulin pumps and other diabetes technologies may lower health disparities***

# Access/affordability

## Insurance coverage:

- CGM and pump supplies may be covered under DME benefits or pharmacy benefits
- Pharmacy benefit coverage expanding, although some pumps remain primarily through DME
- Check Medicaid formularies

## No insurance:

- Financial assistance programs (varying requirements)
  - Omnipod™, Medtronic™, Twiist™
- Payment plans
  - Tandem™, Medtronic™

# Water Resistance

<b>Tslim X2™</b>	Watertight for 3 feet deep up to 30 minutes	Not recommended for use while showering, bathing, or swimming
<b>Mobi™</b>	Water resistant to a depth of 8 feet for up to 2 hours	
<b>Minimed 780G™</b>	Waterproof up to 12 feet for up to 24 hours	Not indented for submersion and is expected to be removed prior to swimming or bathing
<b>Omnipod 5™</b>	Pod waterproof up to 25 feet deep for up to 60 minutes	
<b>Bionic Pancreas™</b>	Waterproof up to 12 feet for up to 30 minutes	
<b>Twist™</b>	Water resistant to splashing water	Disconnect pump prior to bathing, swimming, showering, etc.

# Safety Considerations

# Common Pump Related Issues

Not connected to  
CGM

- Kicks into manual mode

Technology  
malfunctions

Expired pod  
(Omnipod)

Reservoir empty

Infusion set  
problems

- Blocked or kinked infusion set

# Common Pump Related Issues

## Importance of keeping settings updated

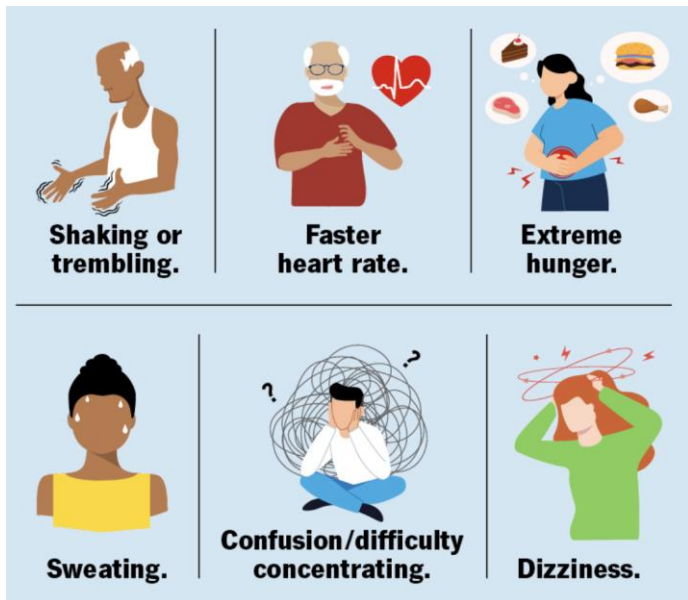
- When pump kicks into manual, will default to programmed settings
- Settings that don't reflect current use can contribute to hyperglycemia or hypoglycemia
- **At every visit: check programmed settings!**
  - May include total daily insulin, weight, basal rate

## Importance of back up plans

- All patients should have a back up plan for insulin therapy in the case of pump failure, trouble obtaining supplies, etc.



# Hypoglycemia



## Treatment

- Mild to moderate: 5-10 grams carbohydrates
  - Less than standard recommendation due to pump also compensating for hypoglycemia
  - Recheck after 15 minutes
- Severe: glucagon
  - Injection, dry nasal spray
  - Glucagon should be prescribed for **every** patient on insulin!

# Hyperglycemia

- Discover **why** blood glucose is elevated
  - Infusion set kinked?
  - Site problems?
  - No insulin in reservoir/pod expired?
  - Pump in manual mode?
- Check for ketones
  - Assess for diabetic ketoacidosis
- Correction bolus
  - Do not enter empty/"ghost" carbs

## Clinicians:

evaluate need to adjust  
ICR, ISF, total daily  
insulin, etc.

# Patient Counseling

# Regimen Modification



## Exercise mode

- Start exercise mode 1-2 hours prior to anticipated start
- For pumps without exercise mode, can adjust temporary target to less aggressive target



## Sleep mode

- Tandem tslim X2™, Tandem mobi™
  - Automated basal only, no automatic correction doses
  - Ensure accurate sleep hours input



## Sick day management

- Importance of maintaining hydration • Regularly check blood sugars • Check ketones • Continue insulin (do not disconnect pump)

# General Pump Counseling

Maximize time in  
automated mode

Trust the pump!  
(Don't enter  
fake/"ghost" carbs)

Pre bolus for meals  
(10-20 minutes prior)

Use suspend  
or temporary targets  
for exercise/activities  
that cause low

"When in doubt,  
change it out"

# Pump Specific Counseling

## Beta bionic™

- Majority of meal announcements should be "usual"

## Omnipod™

- Want CGM and pod in line of sight of each other

## Tandem™

- Consider adjusting "Auto-off" to 16 hours or turning off

## Omnipod™, Twiist™, Minimed 780G™, Tslim X2™, Mobi™

- Save common meals to streamline mealtime boluses

# Assessment Question #3

A 23-year-old patient with type 1 diabetes is starting the Twiist™ AID system after previously using multiple daily injections. Patient has never used another AID system before.

Which of the following is an important counseling point to promote safe and effective use of the AID?

- A. Instruct the patient to avoid manual boluses
- B. Emphasize accurate carbohydrate counting and meal boluses
- C. Disable automated insulin delivery during periods of illness
- D. Change infusion sets only when blood glucose readings become elevated

# Summary/Conclusion

AIDs are important tools to help patients with diabetes meet their glycemic goals and are highly recommended by the ADA for patients requiring insulin

AID systems vary in design, automation level, and settings. Understanding these differences allows for selection based on individual patient needs & preferences

CGM and pump reports provide actionable data to optimize glycemic control. Pharmacists must understand which settings influence automated mode in order to safely and effectively adjust therapy.



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# Questions?

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# Additional Resources

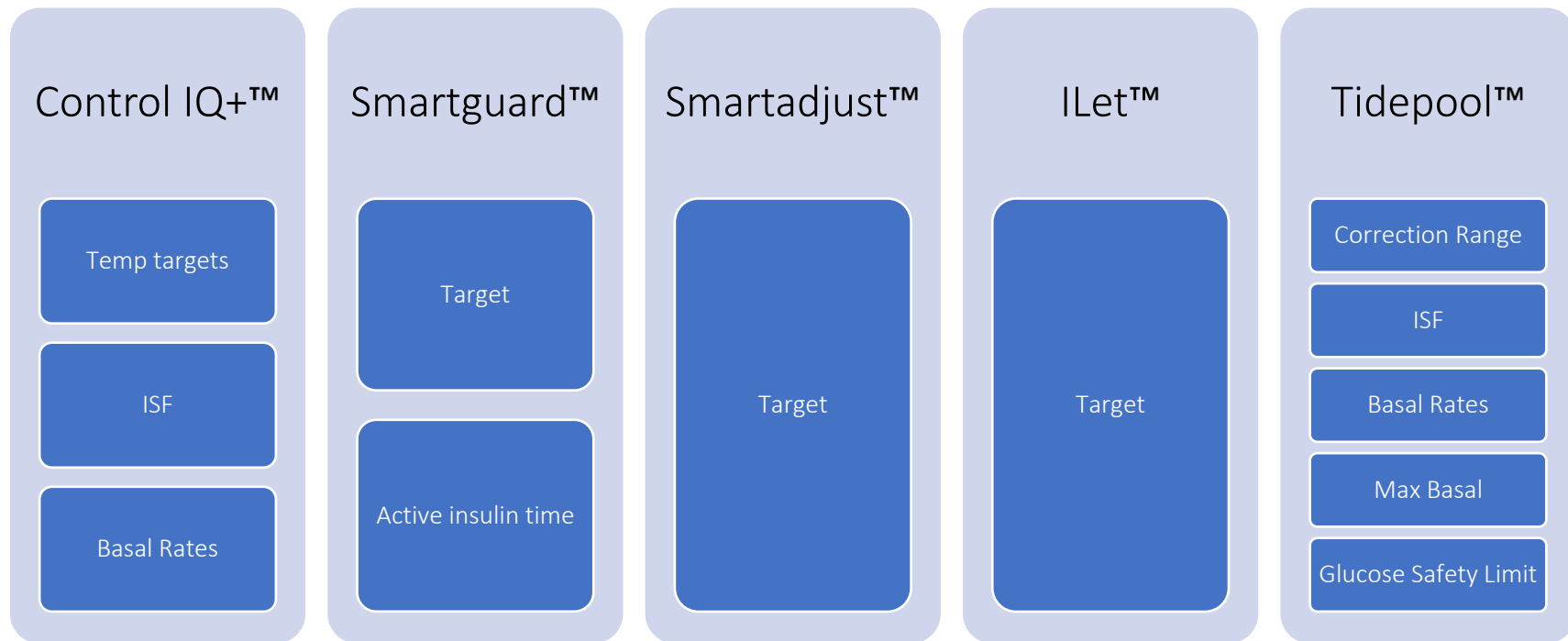


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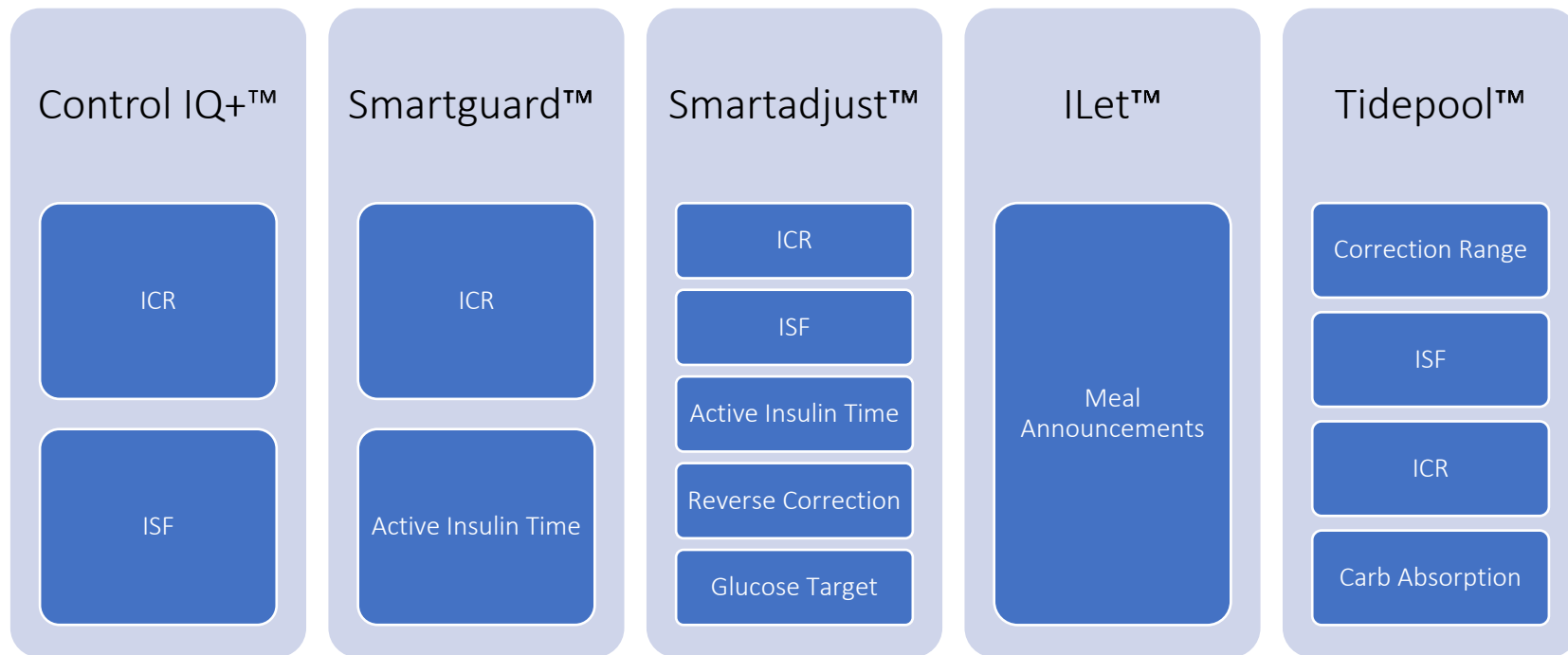


<https://www.adces.org/education/danatech/home>










# Changes That Impact Automation – Basal



# Changes That Impact Bolus



# Tandem™ (Control IQ+™)

		 Control-IQ	 Sleep Activity	 Exercise Activity
  <b>Delivers</b>	Delivers an automatic correction bolus if sensor glucose is predicted to be above ____ mg/dL	180	--	180
 <b>B Increases</b>	Increases basal insulin delivery if sensor glucose is predicted to be above ____ mg/dL	160	120	160
 <b>B Maintains</b>	Maintains active Personal Profile settings when sensor glucose is between ____ - ____ mg/dL	112.5 - 160	112.5 - 120	140 - 160
 <b>B Decreases</b>	Decreases basal insulin delivery if sensor glucose is predicted to be below ____ mg/dL	112.5	112.5	140
 <b>0 Stops</b>	Stops basal insulin delivery if sensor glucose is predicted to be below ____ mg/dL	70	70	80

# Pump level of interaction

